

Kaufman - Trading Systems & Methods - Chap13

Chap13

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13 Spreads and Arbitrage

A position taken in opposing directions in related markets, contracts, options, or shares is called a spread, or straddle. When the dynamics of the spread can be definitively calculated, such as the price of two bonds of the same maturity and the same grade, or the price of gold in two different locations, the transaction can be considered an arbitrage. For futures markets, the most common use of the term spread relates to two delivery months of the same market. For example, a trader may take a long position in March Treasury bonds and a short position in the June contract (for the same year). The expectation is that prices will rise and that nearterm delivery will rise faster than the deferred, netting a larger profit on the long position and a smaller loss on the short.

A spread is most often a way to reduce both the risk and, consequently, the potential profit that exists in an outright long or short position. A spread is commonly placed in two delivery months of the same market, a combination of futures and physicals in the same market, or in two options of different strike prices or maturities. The reduction in risk depends on the relationship between successive delivery months, which varies considerably with the market traded. These can be summarized as follows:

Financial markets nearest to delivery react more quickly and with greater magnitude to changing interest rates, economic data, and supply and demand situations. The deferred contracts will respond more slowly, because the lasting effect on the market is not as clear. Precious metals, such as gold, platinum, and silver, were once considered pure carry markets. Successive delivery months would always trade at a higher price due to the interest rate component of holding inventory. If the price of the metal rises or interest rates rise, the cost of carry increases and the spread between months widens. If metal prices or interest rates decline, the spread narrows. If metal prices and interest rates move in opposite ways, the effect on the spread is dampened to varying degrees. There has been an evolution in the industrial use of precious metals, primarily in electronics, which has increased the consumption and changed the patterns to reflect a more industrial look.

Industrial metals, such as copper, mill show normal carrying charges under most circumstances, but they are affected by, demand to the extent that prices have been known to invert for significant periods of time. Because of their fundamental changes, silver prices inverted for the first time in 1997.

Foreign exchange rates are dependent on the prevailing economic outlook for the specific country, combined with their balance of trade. A stable economy will show nearly unchanged forward rates; a weakening economy will cause the deferred contracts to be discounted. Prices tend to become more volatile as they move away from equilibrium, whether higher or lower. Because exchange rates are quoted in terms of other currencies, everything must be viewed as relative to another economy'.

Agricultural products (crops) contain a well-defined carrying charge

within each crop year. Expected variations in both supply and demand have made delivery, month pat

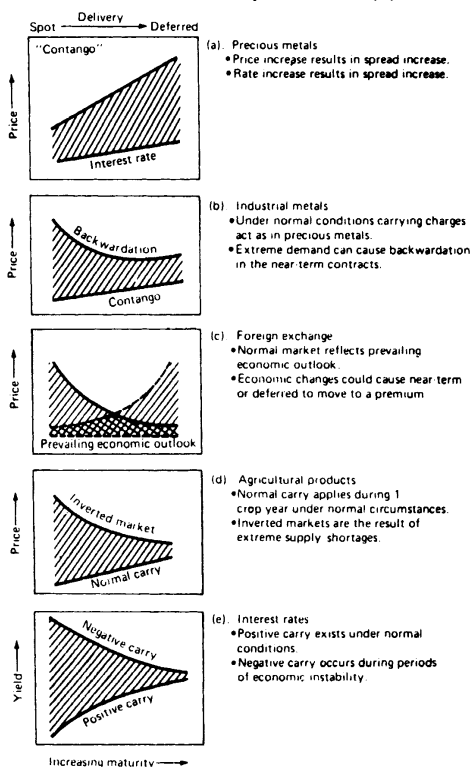
306

terns differ from one another; however, prices rarely achieve full carry (Note that potatoes are an exception to the normal patterns shown by agricultural products.) Livestock markets are noted for products that cannot be stored and redelivered, therefore, the prices for any one contract month are based on anticipated supply and demand at the time of delivery. Feedlots and farmers have been known to deliver early when prices were high or when production costs were rising., however. this will cause an unreplaceable shortage in the nearest deferred months (Figure 131).'

Patterns in

Perry J. Kaufman, "Technical Analysis, in The Handbook of Financial Futures, Nancy H. Rothstein (ed.). (McGrawHill, New York, 1984).

FIGURE 131 Interdelivery price relationship and terminology. (a) Precious metals. (b) Industrial metals. (c) Foreign exchange. (d) Agricultural products. (e) Interest rates.



307

delivery months are a combination of livestock on feed, expectations of marketing, and the price of grain.

Spreads are actively traded between related products. As within a sector of the stock market, such as airlines or technology, there are groups

of financial and agricultural markets that are interdependent. Globalization has made interest rates in the industrialized countries respond to changes in monetary policy by the United States, Germany, and Japan. Changing interest rates then cause changes in foreign exchange rates, which also impact the local equities markets. The meetings of the Group of 7 (G7) further increase the chance of a unified policy by setting common expectations among the largest economies. While there is a clear dependence of one market on the other, the effects are highly variable.

Spreads are often unique to a specific market situation and cannot be generalized for all products. The trader must first understand the basis of the spread relationship before any technical analysis can be applied. It is most important that a trader understand the conditions under which a spread, or even an arbitrage, will fail. This chapter will present many approaches to spreading that very specific; examples are equally limited in scope and application.

SPREAD AND ARBITRAGE RELATIONSHIPS

The relationship between two markets, or between various deliveries and trading vehicles within the same market, will determine the type of trading strategy that may be applied. The types of spreads and arbitrage situations that are most often watched are:

1. Substitute products, such as wheat and corn or cattle and hogs. Product substitution ranges from those markets that are nearly identical (e.g., 3month Tbills and 3month Eurodollars), to cotton and soybeans, which share the same land and growing season.
2. Location spreads, including gold in New York, Chicago, and London; cocoa and heating oil (gasoil) in New York and London.
3. Carrying charge spreads and cashandcarry, where one delivery month is outofline with others.
4. Product relationships, such as crude oil versus heating oil and gasoline, and soybeans versus soybean meal and oil.
5. Usage spreads, including the hogcom ratio, feeder cattlecomfat cattle, cocoasugar, broilerscorn, and lumberplywood.
6. Pureprice differences, such as exchange and interbank currency rates, interest rates of the same maturity and the same grade, where there is no actual cost of delivery or carrying charges.

ARBITRAGE

When the two legs of a spread are highly correlated and, therefore, the opportunity for profit from price divergence is of short duration (less than 1 or 2 days), the trade is called an arbitrage. True arbitrage has, theoretically, no trading risk; however, it is offset by small profits and limited opportunity. For example, a spacial arbitrageur using the interbank market might call one bank in Tokyo and another in Frankfurt to find their rates on the Mexican peso. if they differ, the trader would buy the peso from one bank and sell the peso at another provided:

1. The price difference was greater than the bidasked spread, representing the cost of converting the currencies.
2. The arbitrageur has proper credit established with both banks.

3. The transaction can be performed simultaneously (by telephone). This requires one trader with a telephone in each ear or two traders working sidebyside.

Largescale arbitrage has become the domain of major financial institutions who employ many traders, each provided with hightech computer displays, sophisticated analytic software, and lots of telephones. These traders specialize in specific interest rate markets, foreign exchange, individual stock selection, or less often, precious metals. They constantly scan quotes from across the world to find price differences, then act quickly using cash, forward and futures markets. They trade large quantities to profit from small variations. For the interest rate markets, there are computer programs that compare the various types of coupons and maturities to identify an opportunity quickly. Such operations have become an integral part of the banking industry; they keep rates inline with other banks and generate steady profits.

Pricing of Futures Contracts

The relationship of one futures market delivery month to the spot price of that market is different according to the type of product, which has already been described in general terms. The mathematics of some of these relationships can become very complex, and the reader is referred to texts that deal specifically with these subjects.' The following sections describe the most important features of these relationships.

Storable Commodities

Storable commodities can be purchased in the cash market, stored, and sold at a later time. They can also be delivered on a futures contract, held in storage, and redelivered against another contract. This puts an upper limit on the amount of the carrying charges that can be added to futures prices. The difference in cost between holding the physical commodity and buying it on the futures market are:

1. The financing cost involved in the purchase of the physical commodity:

$$\text{added interest cost} = \text{spotprice} [1 + \text{interest rate}]^t - \text{spotprice}$$

Where life of futures contract is expressed in years. 2. The cost of storage, if any.

3. A convenience cost for not buying the physical product, and the ability to be able to sell it at any time.

These three costs are added to the futures spot price to get the fair value of the futures price at the time of delivery. The strategies that keep the spot and futures prices aligned, where F is the futures price, S is the spot price, r is the annualized interest rate, t is the life of the futures contract (in years) from today to the time of delivery, and k is the net annual storage cost (expressed as a percentage of the spot price) are:

Method 1: Buy the futures contract for F ; take delivery at expiration.

Margin cost can be collateralized. Net cost is F

Method 2: Borrow the cost of the spot commodity S and buy the physical product; pay the interest, $S[1 + rt]$, and the storage netofconvenience cost, $S \times k \times t$, until the corresponding futures market delivery.

⁷See Aswath Damodaran, *Investment Valuation* (John Wiley & Sons, New York, 1996, pp. 4484 58), which provided the basis for these formulas; also see Marsha Stigum, *Money Market Calculations*

The two methods must have the same net cost; otherwise, everyone would choose the cheaper alternative. Therefore the two strategies are equal, and they form the basic arbitrage relationship between futures and spot prices:

$$F = S + S([1 + r]^t - 1) + Skt$$

$$= S([1 + r]^t + kt)$$

This relationship represents the ideal case. If there are separate borrowing and lending rates, r_b and r_a , a seller cannot recover the saved storage costs and there is a normal range in which futures prices can move.

$$(S - t_s)(1 + r_a)^t < F < S([1 + r_b]^t + kt)$$

When futures prices move outside this range, there is a possibility of arbitrage.

Interest Rate Parity

One wellknown, secondorder arbitrage combines foreign exchange forward rates with interest rate parity. Consider the following: A U.S. corporation would like to invest \$1 million for the next 6 months. The current U.S. Tbill return for the next 6 months is lower than the rate in West Germany, and the inflation rate is about the same. The corporation is faced with the decision of whether to convert U.S. dollars to Deutschmarks and invest in West German time deposits or accept the lower U.S. rates. The decision is made easier if the corporation purchases goods from West Germany, since it must eventually convert U.S. dollars to Deutschmarks to satisfy payments; the conversion cost will then exist with either choice.

What if the value of the Deutschmark loses 1% against the U.S. dollar during the 6month investment period? A corporation whose payment is stated in Deutschmarks suffers a 1% loss in the total interest received. If the 6month return was 4%, interest received is now valued at \$400 less than the \$40,000 total, a small amount for the corporation making payment in Deutschmarks. A speculator would face a different problem because the entire return of \$1,040,000 would be reduced by 1% to \$1,029,600, netting a return of only 2.96%, less the additional cost of conversion. For the speculator, shifts in exchange rates often overwhelm the relative improvement in interest rate return.

The interest rate parity theorem will normally explain the differences between the foreign exchange rates and the relative interest rates of countries. It states that the forward rate of a currency is equal to its present value plus the interest

earned in that country for the period of the forward rate.'

Using the futures or interbank market for the forward rate (DM 1yr, is 1 year forward) and the spot rate for the current value (DM spot,), the annual interest rate in West Germany (Lger,) is applied to obtain the relationship

$$DM_{1\text{ yr}} = DM_{\text{spot}} (1 + I_{\text{Ger}})$$

Because the forward value of the U.S. dollar can be expressed similarly as

$$U.S._{1\text{ yr}} = U.S._{\text{spot}} (1 + I_{\text{U.S.}})$$

Compute the implied interest rate/forward rate parity by dividing the second equation by the first:

James E. Higgins and Alan M. Loosigian, "Foreign Exchange Futures," in Handbook of Futures Markets, Perry J. Kauffman (ed.) (John Wiley & Sons, New York, 1984).

310

$$U.S./DM_{1\text{ yr}} = U.S./DM_{\text{spot}} \frac{1 + I_{\text{U.S.}}}{1 + I_{\text{Ger}}}$$

For example, if U.S. interest rates are 8%, West Germany 6%, and the spot rate is 0.5000, the 1-year forward rate would be

$$U.S./DM_{1\text{ yr}} = 0.5000 \frac{1.08}{1.06}$$

$$U.S./DM_{1\text{ yr}} = 0.5094$$

Crossrate Matrix Evaluation

Given the large number of currency exchange rates that can be quoted in terms of any other currency, there are many combinations of rates that might provide an opportunity for arbitrage. The process for uncovering those inconsistencies that offer opportunity is easier if you put all of the rates into a table format often seen in the newspapers. Using simplified values, this takes the form:

		USD
$T =$	USD	1.00
	DEM	2.00
	CHF	1.25
	JPY	.001

Every crossrate in table T is related to every other

$$a_{ij} \times a_{jk} = a_{ik}, \quad \text{for all } i, j, k,$$

where the first subscript is the row, the second is the column. This represents an element in the table, with a_{ij} representing the exchange rate from i to j . Because the top right triangle in the table is exactly the mirror image of the bottom left triangle, the values are usually omitted. Whenever a value in the empty part of the table is needed, it is the inverse from the mirror image of that location:

$$a_{ij} = 1/a_{ji}$$

For the example in table T , $a_{31} \times a_{12} = a_{32}$. Because the exchange rate from the U.S. dollar (USD) to the Deutsche Mark (DEM) is 2.00, and the exchange rate from the U.S. dollar (USD) to the Swiss franc (CHF) is 1.25, the exchange rates between the U.S. dollar (USD), Deutsche Mark (DEM), and Swiss franc (CHF) are equitable. If the two sides of the equation were not equal, there would be a potential arbitrage opportunity. As in all arbitrage, the goal is to take advantage of the opportunity to determine the realistic minimum and maximum values.

Class B Arbitrage

To facilitate the process of keeping prices aligned, there is Class B arbitrage, which takes advantage of the difference between the futures and the interbank forward markets. Class B actually refers to the category of membership on the International Monetary Market of the Chicago Mercantile Exchange, which provides exclusively for this type of arbitrage.

Institutional Arbitrage
Arbitrage is most often associated with institutional trading. Because profits on individual positions are small, it is necessary to trade large numbers; hence, the capital requirements

can be equally large. The most wellknown of all arbitrages is called program trading, the process by which a stock index futures market and the cash index (the weighted average of the actual stock prices) are kept in the proper relationship to one another.

Program Trading

There is nothing secret about program trading. The premise is that cash and futures prices will come together (to within a small price difference) by the time the futures contract expires. At that time the buyers and sellers must settle in cash at the current cash market value. The price of the two markets at delivery will be:

$$F = S(1 + r - y)^t$$

where F is the futures price at delivery, r is the riskless interest rate, and y is the annualized dividend yield. In addition to a deviation from this relationship, you must know:

1. The transaction costs of executing both the stock and futures side of the trade. This includes both commissions and an estimated slippage for each of the stock issues that must be bought.
2. The trade can only be entered with a short sale in the futures and the purchase of stocks because of the uptick rule. The uptick rule requires that share prices only be sold on an uptick, which makes it impossible to guarantee that short positions can be entered in each stock, or that the trade can be completed in a preset time.

In addition to the large costs involved in setting a position in all of the 500 stocks that comprise the S&P Index, there is competition from other institutions. This limits the profit potential of the trade to the smallest acceptable amount over the breakeven level. Adding the more realistic assumptions of distinct borrowing and lending rates made in the basic

**futures arbitrage discussed earlier, plus separate
selling short t_s , the *normal* futures price at delivery**

$$(S - t_s)(1 + r_a - y)^t < F < (S + t_c)(1 + r_b - y)^t$$

Finding a Representative Subset of an Index

An arbitrage would be much easier and less costly if there was a smaller group of stocks or futures markets that performed the same as the entire index. If the index is weighted by capitalization, volatility, or some other characteristic, then sorting the components of the index in order of largest capitalization, or highest volatility, would allow you to find a reasonable subset. In the case of capitalization, it is likely that a smaller

group of stocks would represent 90% of the index value; therefore, that subset would perform in a way very similar to the index. Unfortunately, the S&P 500 is comprised of companies that all have relatively high capitalization.

Another approach to finding a subset of markets that closely tracks the index value is by using stepwise regression, inputting all of the markets that compose the index, and examining the weighting factors assigned to each in the answer. Those markets with the highest weighting factors are the most significant in the movement of the overall index. By creating a smaller basket from those markets with the highest weighting factors, you can achieve a close approximation of the index with few components at least temporarily. The influence of the components may change, causing the weighting factors to change; therefore, the regression would need to be rerun frequently, and the basket adjusted to stay aligned with the index. Unless you are sure that the subset of the index that represents 90% of the movement will continue to reflect the index movement until expiration, you have replaced an arbitrage with a simple speculative position.

312

Intermarket Spreads

The propagation of financial and stock index futures markets have expanded the number of markets that are interdependent upon one another. Prior to the influx of financial markets, product substitution (hogs and cattle, feedgrains) and location spreads were the most common activity; silver in New York, London, and Chicago, and gold in New York and Chicago received much attention. Now there are a large number of interest rate markets of all maturities in many countries, and stock index markets attempting to measure high cap, low cap, and sectors, as well as the old favorites, the S&P 500 and the DJIA. Even, country seems to have introduced its equity index into the marketplace, all with the idea of competing for their share of hedgers, speculators, and investors.

Spreading two stock indices expresses a particular market opinion. If you consider three popular indices, the Dow, S&P 500, and the NYSE Index, we see that each represents an increasing picture of business economy. The Dow, limited to blue chips, includes very stable companies not affected by minor events. On the other end of the spectrum, the NYSE Index is the average of all shares and expresses the broadest view of the economic health. If you believe that the economy is headed for a downturn, but do not want to be net short the entire market, then a spread which is long the Dow and short the NYSE Index would be a lower risk approach to implementing that position.

Figure 132 shows the spread between the Value Line Index, the first stock index market in Kansas City, and the S&P 500 in Chicago, once the most active stock spread. As is often the case, traders are attracted to the most active market, and there is significantly less liquidity in one leg of the spread.

There are many dependent relationships between futures markets. Because the basis for these are fundamentally sound, spreads are an excellent way to profit from shortterm divergence. The most

comprehensive study of these relationships can be found in John Murphy's *Intermarket Technical Analysis*,⁴ in which he studies the leads and lags between markets and examines the interaction in their relationships. Of these, Figure 133 shows how two markets can trend in the same direction, but have short periods of extreme divergence. Interest rates, represented by U.S. bonds, are a dominant component in the carrying charges of most markets; therefore, when yields rise, physical commodity prices rise, as seen in the CRB Index. Other events, however, can overwhelm this relationship and cause violent distortions.

Traders must be cautious when attempting intermarket spreads. Because they are on different exchanges, the simultaneous execution of both legs cannot be guaranteed by either exchange. In addition, each leg must be entered at the market with orders placed at almost the same time. Further care must be taken to understand the differences in the contracts; for example, the three wheat contracts in Kansas City, Minneapolis, and Chicago trade wheat of different types for different purposes, and each of the stock index markets represents a different view of public participation. Intermarket wheat spreads can often go the wrong way. Even the Dow will shift relative to the S&P 500 when market participants concentrate on blue chips.

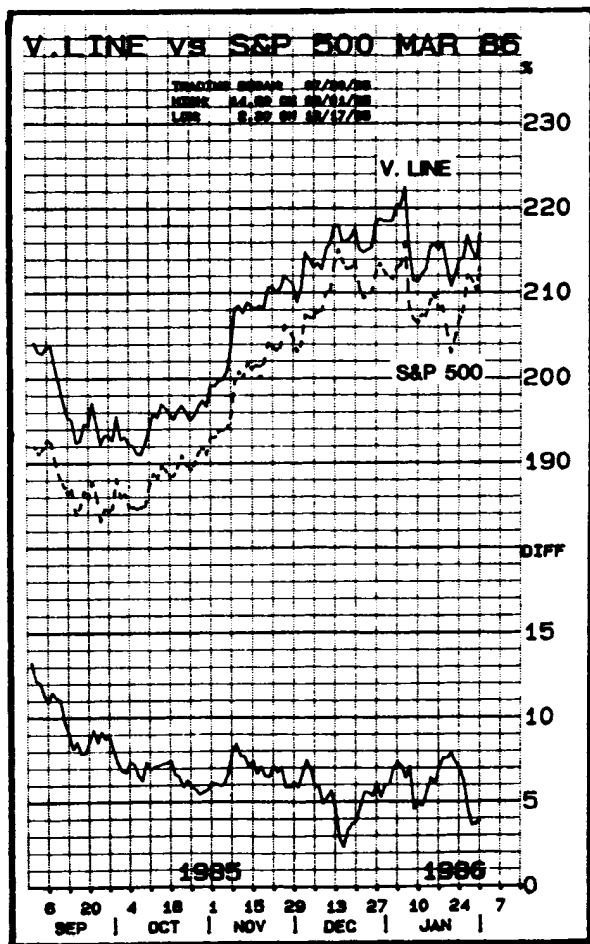
Additional care is needed when exchanges offer lower margins for intermarket spreads. A lower margin can result in extreme leverage, which may not always be justified for intermarket spreads. When prices diverge, the leverage can work against you.

Product Spreads

Product spreads are very actively traded. The soybean crush, the most popular among futures traders, has been used for many years. Product spreads usually involve three mar

⁴ John J. Murphy, *Intermarket Technical Analysis* (John Wiley & Sons, New York, 1991).

FIGURE 132 Intermarket spread between Value Line and S&P 500.



Source: Commodity Research Bureau Weekly Chart Service .

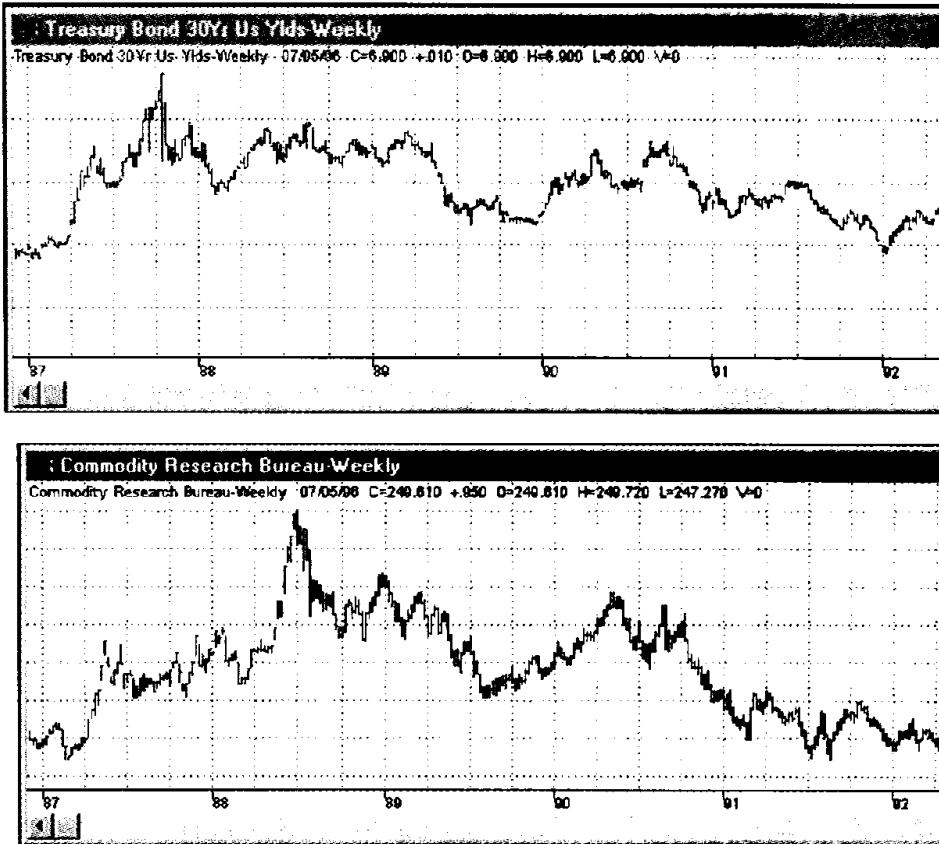
kets, which may be of different delivery months, depending on the processing time. The most common product spreads are:

Raw product(s)	Resulting primary product(s)
Soybeans	Meal and oil
Crude oil	Gasoline and #2 heating oil
Feeder cattle and grain	Fat cattle
Feeder pigs and corn	Live hogs
Live hogs	Pork bellies

Exchanges often allow reduced margins when these spreads are entered in the proper proportion at the same time.

FIGURE 133 A comparison of U.S. Treasury bond yields and the CRB Index, 1987-1993.

A very similar trend is disrupted by an occasional large divergence. In most cases, a noticeable rise or fall in the CRB Index is followed by a change in interest rates in a manner intended to offset the effects of inflation.



Source: Charts created with TradeStation® by Omega Research, Inc.

Product spreads do not always correct for distortions within the time needed to be profitable for the trader. When the combined return on soybean meal and oil is below the cost of crushing the soybeans, processors may execute a reverse soybean crush spread, in which they sell the soybeans and buy the products. Even though this appears to be a clever way of keeping prices inline, it is not done until the crushing margin is very negative. Processors cannot readily reduce their level of operation and lay off employees; a reverse crush means that they are buying products as well as producing them, a position of significantly increased risk.

The Crack Spread

Crude oil is refined primarily into gasoline and heating oil. As with the soybean crush, where the processor buys soybeans and produces meal and oil, the refiner expects a profit from the business of buying crude oil and selling gasoline and heating oil. A speculator can theoretically participate in this process by buying crude oil and selling the products in the right proportion and in the correct delivery months. For example, if crude oil was trading at \$20 per barrel, heating oil at 52.400 per gallon, and gasoline at 59.50~ per gallon, then based on futures contracts of 1,000 barrels of crude and 42,000 gallons of heating oil and gasoline, we could calculate each contract value:

315

Gasoline component: $59.50 \times 42,000 = \$24,990$
Heating oil component: $52.40 \times 42,000 = \$22,008$
Total components: $\$46,998$
Crude oil component: $20.00 \times 1,000 = \$20,000$

Two other important facts are necessary to put this trade together:

1. It takes from 4 to 6 weeks to refine crude oil into its products; therefore, the prices used in the crack spread should always take the product prices quoted 1 month after the crude price.
2. While the refining ratios can vary during the year, based on the higher demand for gasoline in the summer, and the higher demand for heating oil in the winter, the standard ratios are found in Table 131.

Although there are many other byproducts of the refining process, the major components of fuel oil and gasoline are produced in a ratio of slightly more than two parts gasoline to one part fuel oil on average each year. This ratio then accounts for the 321 crack spread, in which three contracts of crude oil are bought, and two contracts of gasoline and one contract of heating oil are sold. In the example above, we can complete the net transaction as follows:

	<i>Market</i>	<i>Price</i>	<i>Quantity</i>
Sell 2	Gasoline contracts	$59.50 \times 42,000 =$	
Sell 1	Heating oil contract	$52.40 \times 42,000 =$	
Buy 3	Crude oil contracts	$20.00 \times 1,000 =$	
	Net transaction (without costs)		

Transaction costs will include the expectation of buying crude oil higher and selling products lower than desired when the trade is entered, the commission, and the cost of holding the contracts until delivery

TABLE 131Fuel Oil and Gas Production and Ratios, 19841992

	Fuel Oil			Gases		
	Distillate	Residual	Total	Gasoline	Jet Fuel	Kerosene
1984	981	326	1,307	2,371	414	42
1985	981	322	1,303	2,352	434	34
1986	1,021	324	1,345	2,476	472	33
1987	997	323	1,320	2,506	490	29
1988	1,046	339	1,355	2,555	501	29
1989	1,152	500	1,652	2,684	544	31
1990	1,067	347	1,414	2,650	556	16
1991	1,081	341	1,422	2,554	525	14
1992	1,088	326	1,414	2,591	512	15

Source: *The CRB Commodity Yearbook, 1994* (John Wiley & Sons, 1994).

316

Reverse Crack

When the delivered price of the products totals to less than the cost of crude oil, the refiner has no reason to process the crude oil, and can go to the market to buy the products and sell crude. This is called a reverse crack. In reality, processors can perform a reverse crack to some degree, but shutting down operations to accommodate a temporary market condition is not a good policy. The process of shutting down and restarting a large refinery is not simple, and labor problems make matters more complicated. When executing a reverse crack, the same delivery months are used for both crude and products.

CHANGING SPREAD RELATIONSHIPS

Some spread relationships will always exist, while others may change due to:

1. Price level, such as during the silver bull market of 1980
2. Consumer tastes, such as a shift away from red meat
3. Health reasons, such as those often concerning nitrates in bacon
4. New competition, such as increased supply of edible oils from the Far East impacting the soybean product relationship, or the effect of highfructose corn sweeteners on the sugar industry

Even though the market absorbs the anticipation of change in an orderly way, unexpected events relating to health or interruption of supply can produce a price shock that will affect many spreads.

Gold/Silver Ratio

A relationship that has always been followed with keen interest is the gold silver ratio, traditionally considered normal at 33 : 1. It serves as a good example of the variability of many perceived spreads. When gold was \$35 per ounce and silver about \$1 per ounce, the relationship was never very stable. Between 1930 and 1915, silver prices dropped to about \$.50 per ounce; from 1951 to 1962, they remained just under \$1 per ounce, and

afterward silver began its accelerating move to \$38 per ounce in January 1980. Between 1911 (when the International Monetary Fund (IMF) was formed) and 1913, the price of gold was fixed at \$35 per ounce, although in a few years before the cancellation of the agreement, the price varied above the designated value. From the late 1960s until the silver crisis of 1980, the gold/silver ratio ranged from about 20 : 1 to 45 : 1 in a slow cycle. During the crisis attributed to the Hunt brothers (September 1979-September 1980), the ratio fluctuated around 33 : 1 in a highly volatile pattern moving only slightly above and below its historic pattern. Following the silver crisis, the value of silver declined faster than gold, reaching a ratio of 56 : 1 in June 1982, with gold at \$314 and silver at \$5.57. A year later, the ratio touched 33 : 1 and rapidly widened to 66 : 1 in June 1986.

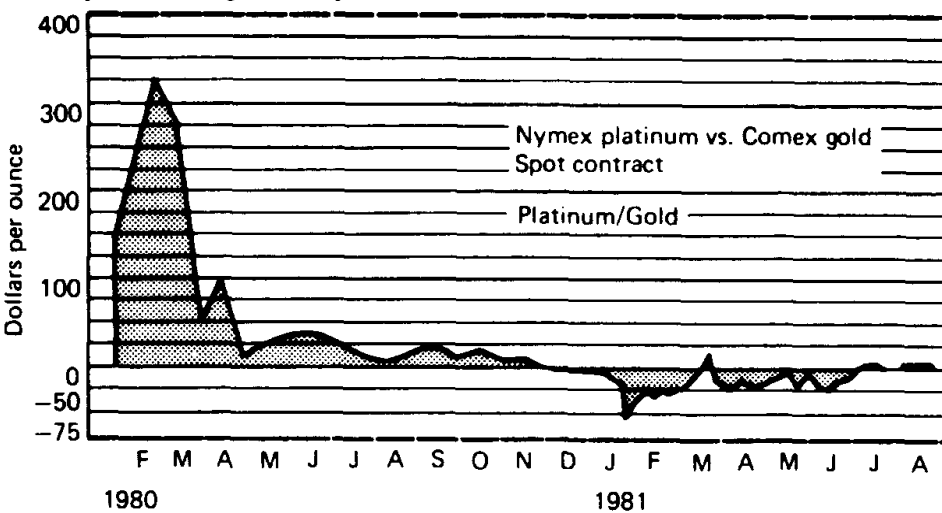
Is the gold/silver ratio a tradable spread? Was it ever a good spread trade? Probably not. The relationship is mainly dependent on public perception of both items as all enduring store of value. The same is true for the platinum/gold ratio (Figure 13.4) or the value of gems. Prices remain strong as long as the public confidence is unshaken. There is no fundamental reason for these prices to remain in the same ratio as there is for feedgrain prices to adjust relative to their protein content.

The public was hurt during the silver crisis. Many people made their purchases during the latter part of 1979, then lost heavily in 1980. At the same time that the U.S. dollar was gaining incredible strength and interest rates were still high, gold and silver prices were dropping rapidly.

Naturally, the value of gold did not decline as much as some other investments. Many countries still hold gold as a store of value. But times change and there has been a notice

317

FIGURE 13.4 The platinum/gold spread, similar to gold/silver, shows periods where it might be successfully traded; however, markets such as 1980 always remain a possibility.



able shift to the U.S. dollar as an international standard. Investors feel safe with their money in U.S. banks and in U.S. dollars; they are willing to suffer shortterm currency swings in exchange for security and diversification. For example, the price of oil, the largest traded commodity in the world, is quoted in U.S. dollars rather than gold.

There is no doubt the U.S. dollar will lose glamour if U.S. leadership or its economy weakens; if world peace becomes a reality, the security of the dollar will also be less important. If there is significant economic instability, there may be a return to gold and diamonds as an implied standard. However, these relationships are too uncertain to be tradable, except at great risk.

Intramarket and Intermarket Financial Spreads

Spread relationships in financial markets represent anticipation of economic policy. The spread values themselves are well defined by the interrelationship of all interest rate vehicles, but they will vary on the interpretation of the impact of government policy on money supply in reaction to the balance of trade, unemployment, and an expanding economy, and the time period in which the action will occur.

An intramarket spread, or delivery month spread, in a single financial instrument, such as Tbills, is a conservative speculation in changing policies as discussed in the previous section. A bull spread, long the nearby and short the deferred, shows a belief in temporarily declining interest rates. An intermarket financial spread, involving different maturities, is a speculation in the changing yield curve. A long bonds/short bills position favors a negative carry, while long bills/short bonds expects a return to normal carry (with respect to futures prices).

Intercrop Spreads

A special case involving carrying charges is the intercrop spread, which can be highly volatile, even though there is an old crop carryover that ties the two seasonal markets together. Soybeans, for example, are harvested mainly in September and October. The August delivery is clearly the old crop, and November is the first new crop month; the September contract often reflects the shift from old to new.

318

Normally, the old crop trades at a premium to the new crop. Carrying charges, accumulating since the previous winter, are part of the August price; export demand may cause shortages in the old crop, which moves prices further above the cost of cash. Figure 135a shows the anticipated price pattern resulting from carrying charges during a normal year. The minimum storage commitment for the 3 months immediately following harvest is shown as a larger increase in price. Normal carry adds equal amounts to the price until the following September, where old and new crop mix. Finally, any carryover must assume the price of the new crop, which is in greater supply.

The theory behind an intercrop spread is that prices must come together when the old crop merges with the new crop. But can it be a profitable trade? Examine the two possible events that affect this trade:

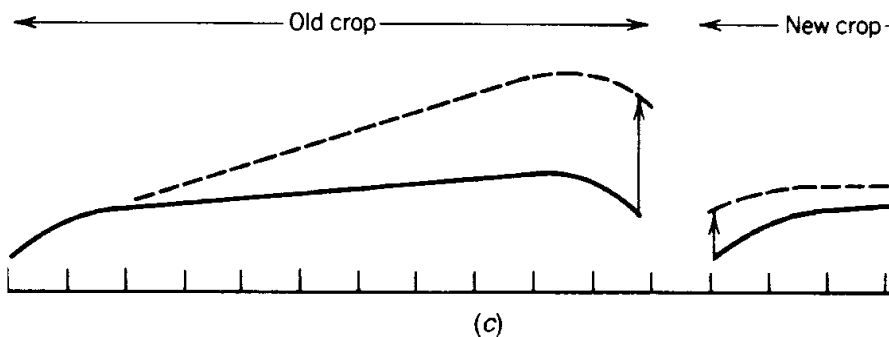
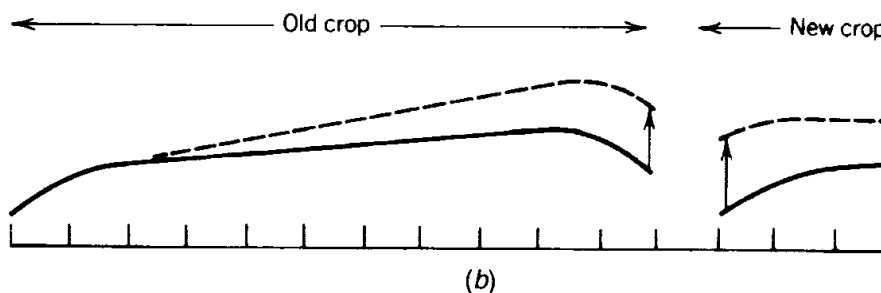
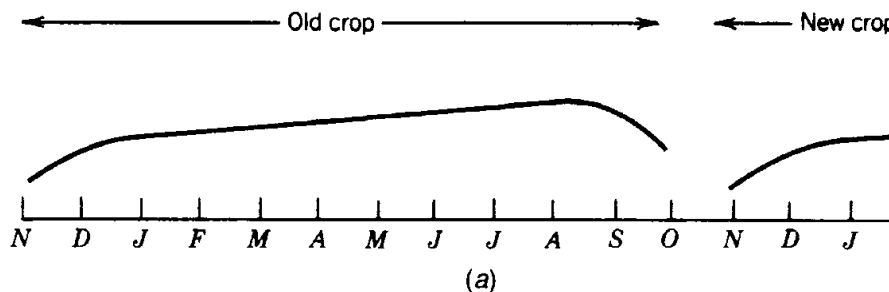
1. Problems involving development of the new crop making supply

uncertain. This causes prices in the new crop to rise more quickly than the old crop (Figure 135b).

2. Export demand in the old crop results in old crop prices rising faster than new crop prices (Figure 135c).

In case 1, the spread between crops narrows and can only be traded as a spread that is short the old crop, long the new crop. This spread has limited potential since the November delivery cannot exceed the old crop by more than the normal carrying charge. At that

FIGURE 135 Intercrop spreads. (a) Normal carrying charge relationship. (b) New crop supply problems result in narrowing spreads. (c) Export affects the old crop more than the new, resulting in a widening spread.



point, processors will buy, store, and redeliver the old crop against the new crop. When prices in the new crop are nearing the old crop value, it makes sense to liquidate or even to reverse the spread. Once reversed, there is little risk that the spread can move adversely. A revised crop estimate that showed better yield than originally expected would cause the new crop to decline sharply and the spread to widen.

in case 2, export demand in the old crop causes the intercrop spread to widen at first. A spread trader will typically wait until export commitments are complete, then sell the old crop and buy the new. When old crop prices rise to a large premium over the new crop, many processors will reduce purchasing based on:

1. Low or negative profit margins at the current price levels
2. Use of reserves or inventory to carry processing through until the lower new crop prices are available

It is remarkable how demand is inversely related to price, even when it is considered inelastic. When a delay in purchasing or processing will result in greater profits for the commercial, it is somehow achieved.

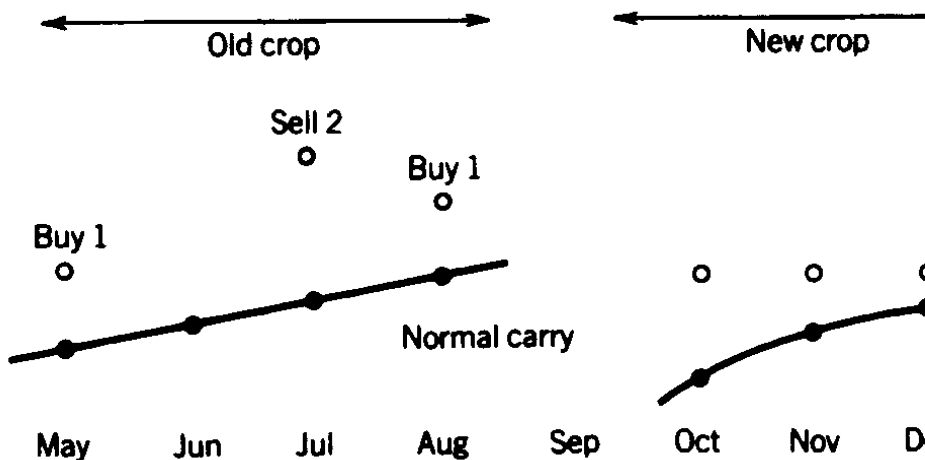
Butterfly Spreads

A butterfly spread, normally referred to as just a butterfly, is a lowrisk technique for capturing shortterm interdelivery distortions. It is most appropriate in highly volatile markets, where the concentration of trading in one or two delivery months causes those contract prices to move away from the normal delivery month relationship.

For example, in April a combination of poor planting, declines in the U.S. dollar, and new export agreements changes the soybean prices as shown in Figure 136. Increased demand results in sharply higher July futures prices with a tapering off of the effect in the more deferred contracts. The normal carrying charge relationship is shown as a straight line in the old crop, beginning again in the new crop. A butterfly entered in the old crop would mean selling two contracts of July soybeans and buying one contract each of May and August. This is the same as executing two spreads: long May, short July and short July, long August.

Each spread in the butterfly has a good chance of being profitable; the combination of the two is exceptionally good. The July contract cannot remain outofline with the deliveries on both sides, because a trader could take delivery of the May contract and redeliver it in July at a profit exceeding the cost of carry. Under normal circumstances, commercial users of soybeans will defer their purchases to later months, depleting their reserves, to avoid paying a shortterm premium and causing July prices to drop.

FIGURE 136 Delivery month distortions in the old crop making a butterfly spread possible .



320

The butterfly spread guarantees that any adjustment in the three contracts back to a normal relationship will prove profitable. If the prices of both May and August rise to be inline with July or if May rises to form an inverted relationship, the spread will be profitable (Figure 137).

The problem with such an ideal spread is the short life and difficult execution. Because profits are nearly riskless, opportunity is small. The beneficiaries of these trades are usually the floor traders who can act quickly. Once the position is entered, liquidation can be easily accomplished.

Pseudoarbitrage of S&P Day and Night Markets

intended to take advantage of distortions caused by S&P MarketonClose orders and GLOBEX session, Connors and Hayward have created a GLOBEXIS&P Fair Value Program.'

1. Determine the daily fair value difference between the S&P futures and cash markets, $W = \text{S\&P futures} - \text{S\&P cash}$. Use the price as soon after the close of the NYSE as possible, for example, 4:03 EST, leaving 12 minutes to the close of futures trading.
2. Calculate your price entry target, T , as $T = \text{S\&P cash} + W + .50$, where the value .50 represents 1/2 an S&P point.
3. Place a sell order at price T If the market is already trading above T just after the NYSE close, then entering the order as MarketonClose of futures is likely to be best.
4. if filled, cover your short if your profit is .50 during the 16 hours of GLOBEX trading.
5. Close out the trade on the close of GLOBEX if your profit has not been reached. Do not carry the trade into the next session.

The justification for this situation is the investors' fear of an overnight drop in price. it depends on the lack of overnight news that would drive the market higher; however, analysts might note that S&P price shocks always

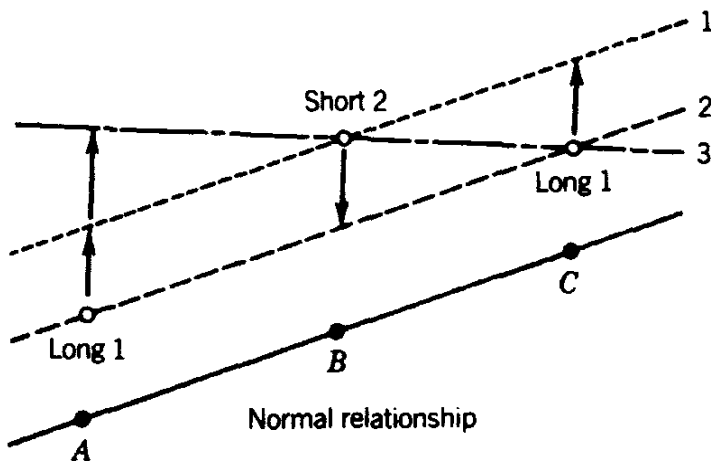
cause prices to drop. It is strongly suggested that no position be taken on the evening that the President gives the State of the Union Message.

CARRYING CHARGES

The carrying charge structure of a market determines the underlying differences in the relative price of each contract. For metals and most storable commodities, these charges con

' Laurence A. Conners and Blake E. Hayward, *Investment Secrets of a Hedge Fund Manager* (Probus, 1995).

FIGURE 137 Corrections to interdelivery patterns.



321

sist of interest, storage costs, and insurance. All else being equal, a market with normal carry can be expected to show steadily higher prices for deferred contracts based entirely on the cost of carry. Prices that move out of line may be corrected by taking delivery of the nearby and redelivering against the next contract.

It is always possible for changes in supply and demand to alter the relationship of futures contracts so that the carrying charge pattern no longer appears normal. Although this is not likely to occur in the metals, it often happens that an immediate demand for food can cause short-term increases in prices without substantial effect on more deferred months. This situation is called an inverted market, or negative carry, even though the carrying charges are implicit in the price regardless of the pattern.

In the financial markets, a similar situation occurs when the demand for money increases dramatically in the short term. If the market expects that the demand will be shortlived, the rates on short-term maturities are significantly affected, whereas the longer-term rates may show only a minor change.

In the metals markets, a normal carry is called *contango* (a term coined by the London Metals Exchange when referring to copper) and a negative carry is *backwardation*. Changes in supply and demand that lead to backwardation are most likely to occur in the industrial metals where the commodity is consumed at a greater rate. Gold, silver, and platinum, the

precious metals markets, have traditionally had a uniform price relationship in the deferred delivery months. Any deferred delivery price can be calculated by adding the current rate of interest (plus storage and insurance) to the value in the cash market. If interest rates rise and the price of gold remains the same, the carrying charges and the spread will increase. If the price of gold rises but interest rates remain constant, the carrying charges and spread will also increase because the increased value of the contract results in higher interest costs. Similarly, lower carrying charges and a narrowing spread will occur if either or both the rate of interest or the price of gold declines.

The terms used in referring to carrying charges in the financial markets are the same as those just mentioned, but the concepts are different. Carry is a term describing the yieldcurve relationship. The concept of positive or normal carry is a curve that increases in yield with the time of maturity. The longer an investor is willing to commit money, the greater the yield. Negative carry can also exist for short periods of time. When economic conditions become unstable, the interest on shortterm investments may increase sharply. Although longerterm rates will increase only slightly. Investors anticipate a correction in these shortterm distortions, and do not often move money committed for longer periods for fear that rates will return to positive carry. The various relationships and terminology that exist in each market sector can be found in Figure 131.

Implied Interest Rates

A pure carry market is one in which the forward price is entirely comprised of the costs of holding the physical product until a predetermined delivery date. As previously mentioned, these costs are those of storage, insurance, and the loan rate. As an example, consider gold, which is a classic pure carry market.

Assume that spot gold is selling for \$300 per ounce and the 6month forward contract for \$313.50, an increase of 4.5%. With interest rates at 7%, there is a possibility of increasing the return on investment by purchasing gold at the current spot price of \$300 per ounce and selling a futures contract 6 months deferred for \$313.50. The gross profit is the difference between the futures price and the value of a comparable cash investment. Compare this with an initial investment of \$30,000, which corresponds to the size of a 100ounce futures contract of gold. That is,

322

6month return on \$30,000 cash at 7% = \$1,050

6month futures price = 313.50

Less the spot price = 300.00

Gives the profit per oz. = 13.50

Times the contract size of 100 oz. = \$1,350

The gross improvement over the cash investment is \$300, or 1% over the 6month investment period; however, there are costs involved in this cashandcarry that do not exist in a straight time deposit. In addition to the storage and insurance of the physical gold, there are transaction costs involved in the trading of futures. Because these costs are relatively fixed, they are known in advance and the potential profit level of the cashandcarry

can be calculated.

The Limited Risk Spread

if the nearby month of a storable commodity is at a discount to a deferred month by more than the cost of carry, a limited risk spread may be entered by buying the nearby and selling the deferred. The trader then takes delivery of the nearby and redelivers it against the later contract. When trading commodities, which are significantly influenced by supply and demand, the outcome of this trade is never certain.

For example, the crude oil and copper markets are not affected by weather or planting conditions, and their supply is readily available. Demand has caused both markets to become inverted for long periods of time. Anticipation of lower prices, reduced demand, or a poor economy may result in a hand-to-mouth purchasing policy. This causes a concentrated short-term demand in the spot market and little activity in the deferred months, resulting in higher prices in the nearby months than further out. Carrying charges are still an integral part of the deferred price; if they were absent, the inversion would be more extreme. Even when they appear to have normal carry, these markets are not candidates for an implied interest rate or cash-and-carry spreads.

The limited risk spread may be better termed a limited profit spread. Whereas the carrying charges provide a theoretical limit to the premium that a deferred month may have over a nearby, there is no limit to the discount that a month may take on. An increase in the expected supply might change a normal carry market to an inverted one, resulting in large losses.

The Carrying Charge Spread

The carrying charge spread is a popular trade based on anticipation of interest rate change and is, therefore, a lower risk than a net long or short position in any market. Consider gold again as an example.

In 1978, the price of gold was low (under \$200 per ounce) as were interest rates (about 6%). An investor who had the foresight to expect both gold and interest rates to rise but who wanted to limit the risk of a speculative position, could have entered a bull spread by buying a deferred contract and selling a nearby contract of gold. The number of months between the contracts would determine the potential for both profit and risk; the further apart, the larger the carrying charges and the greater the expected spread movement.

TECHNICAL ANALYSIS OF SPREADS

Once the spread components have been selected and there is full confidence in the underlying fundamental relationship (even if temporary), the extreme levels and trends may be found to determine which spread trades may be entered.

Most technical analysis of intramarket spreads (e.g., March-December T-bonds) is represented as variations or distortions from the normal price relationship. In this method of trading, the distortions are also called overbought and oversold conditions and the strategic approach taken is countertrend. By subtracting the deferred price from the nearby

(e.g., December from March of the same year) over the life of the contract for many years. the investor can measure the historic patterns (see Figure 138). These spread relationships will vary in a manner that allows the trader to set objectives. When March is trading 1 V, points over December, the spread can be sold; when March trades under December by 1V4 points, the spread can be bought.

Historical Comparisons

Those spreads with a sound fundamental basis will show clear patterns in their price history. Analysis of longer historic periods will result in a better understanding of the consistency and risk involved in trading the spread. A longterm study will reveal seasonal and cyclic moves as well as periods of lower and higher volatility

Many spread opportunities result from understanding changing spread patterns. For example, Figure 139 shows a longterm spread that has three distinct ranges, marked along the bottom as a, b, and c. During period a, spread traders would have identified +1 and 1 as the extreme levels and entered positions at those points; the risk varied but remained within an acceptable range. The higher volatility during period b would have caused large losses for those traders still expecting the prior market patterns.' unprecedented shifts in the spread relationship would prompt traders to liquidate spreads. As period c begins, traders change their objectives to wait for a spread opportunity at 2, Although they could not profit from the original extreme moves because spreads were entered too early, they are prepared for the next time. But instead of repeating itself the spread narrows until it settles in a range of 1/2. if it is now traded in this range, an increase to the prior normal levels of period a will produce a large loss.

This dilemma is common to spreading; spread prices shift from one range to another. When the range decreases, few spreads are taken, and when it increases, a large loss occurs. The following outlines possible solutions to this problem:

1. Underlying pricevolatility relationship. Higher prices allow the spread to widen, whereas lower prices force the spread price to narrow. The spread between heating oil and gasoline must be greater when those products are trading at \$ 1.00 per gal

FIGURE 138 Intramarket interest rate spread relationship.

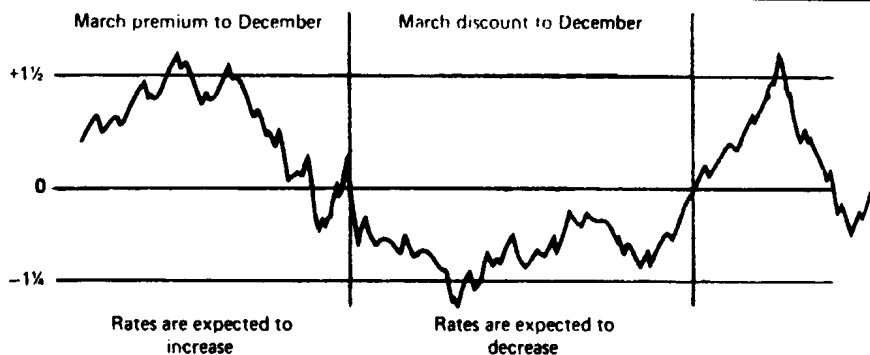
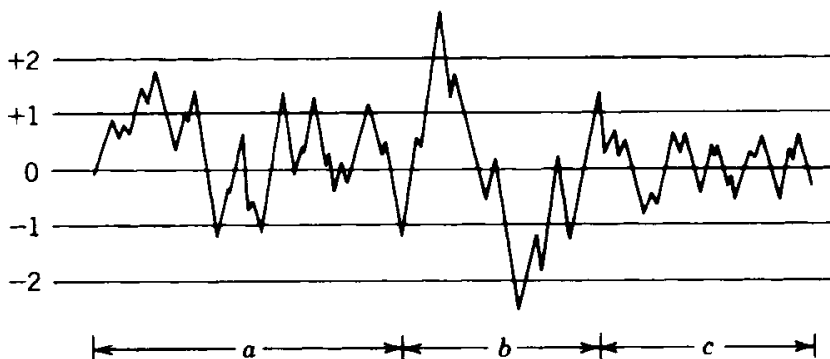


FIGURE 139 Changing spread ranges.



Ion than when they are at onehalf that price. Figure 138 could easily be related to changing price levels, where a is a longterm bull market, peaking in period b, and followed by a decline to lower levels in period c.

2. Normal seasonal patterns. Seasonality causes spreads to narrow and widen in predictable ways. During harvest, the basis spread (the difference between the spot and cash markets) widens, reflecting the available supply. After harvest, the basis will continue to narrow if demand fails to materialize.
3. Specific events
 - a. A freeze in coffee or orange juice results in a prolonged shift in prices, which will then make the next year's crop even more sensitive to a potential freeze.
 - b. Events that cause seasonal price changes, such as exceptional crop demand, will nullify the seasonal patterns for the remainder of the crop year and often into the next season.
 - c. Combination of circumstances, such as low inventory, stocks, or carryover, prior year higher export demand; and dry, hot weather midway in the growing season will result in a nervous market, causing prices to rally in anticipation of problems becoming real. By observing past similar situations, the extent of the rally can be observed as large enough to use a medium to fast trendfollowing method, with profit taking either at the time the trend turns or 1 month before harvest begins, whichever comes first.

Relative Spread Opportunities

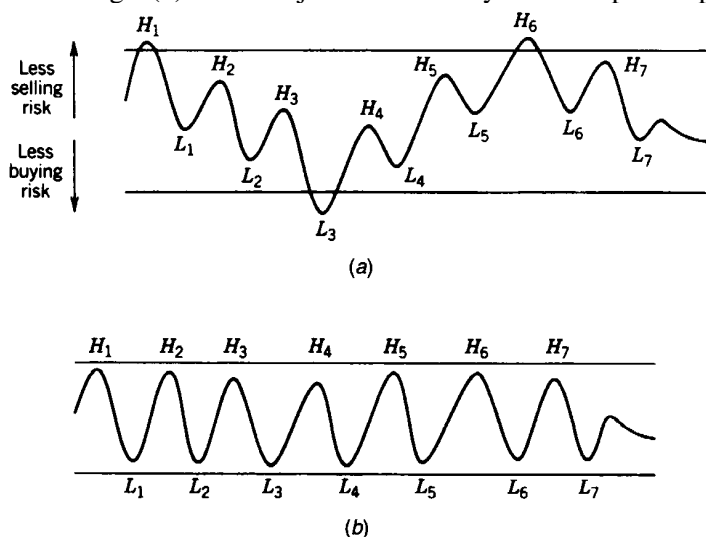
The longterm analysis of a spread relationship will show the extent of variability and include most patterns. When the spread range is wide due to shifts caused by inventory cycles, changing public opinion, and other factors, a relative measure will be of interest. Figure 1310a shows a simple example of a more complicated spread pattern.

The safest spread trades are those taken at the beginning of a return to normal levels; these trades do not require the same level of risk as those taken at the end of a trend. There are opportunities to sell a *relatively overbought* ($H_2, H_3, H_4, H_5, H_6, H_7$) and to buy a *relatively oversold* ($L_1, L_2, L_4, \dots$). There is less risk if the relative levels are closer to the normal level.

The relative spread levels can be found by comparing the current price and a moving average. The number and timing of these trades will vary with the speed of the trend; the faster the trend, the more relative highs and lows will appear and the smaller the profit. Figure 13-10b shows a detrended spread chart based on a moving average. The relative highs and lows are clear; however, it is not possible to trade those with greater risk. When actually trading

325

FIGURE 13 10 Relative spread opportunities. (a) Spread prices showing relative swings. (b) Prices adjusted to identify relative spread opportunities.



than a profit, it will be necessary to use both charts to select the proper trades: one to locate the relative highs and lows, the other to determine risk. Trend Analysis of Spreads

Moving averages, pointandfigure, and other trendfollowing methods are usually inappropriate for intramarket spreads. The time needed to develop a buy or sell signal using a trending approach often takes most of the potential profit from the trade. The magnitude of the profits and losses resulting from these spread trades is usually small compared with an

outright long or shortmarket position.

Trendfollowing methods apply to spreads when the movement of the spread is large enough to justify sacrificing both the beginning and end of the move to determine the direction of the trend. Using Tbonds and Tnotes as an example, the trader selects the delivery month to be analyzed (usually the same one) and subtracts the Tnote price from the bond price. The resulting price is treated as a single new market; a moving average, pointandfigure method, or another trendfollowing technique can be applied to these new numbers. When a buy signal occurs, the spread is bought (bonds are increasing in price with respect to Tnotes), and when a sell signal is generated, the spread is sold (bonds are decreasing in price with respect to Tnotes). These techniques can work as well as any analysis of the individual markets and lower margin requirements boost the returns that may result from net moves of lower magnitude.

Spreads that typically allow trend analysis are those with very wide swings extending for long time intervals. Some examples of these spreads (Figure 1311) are:

Short versus longterm interest rates (trading the yield curve)

Index markets representing diverse market segments

Index markets in different countries

Hogs versus cattle

Gold versus silver

Currency crossrates

FIGURE 13-11 Trending spreads. (a) T-bills versus T-bonds, March 1986. (b) Cattle versus hogs, February 1986. (c) Gold versus silver, December 1986. (d) British pound versus Deutschemark, March 1986.

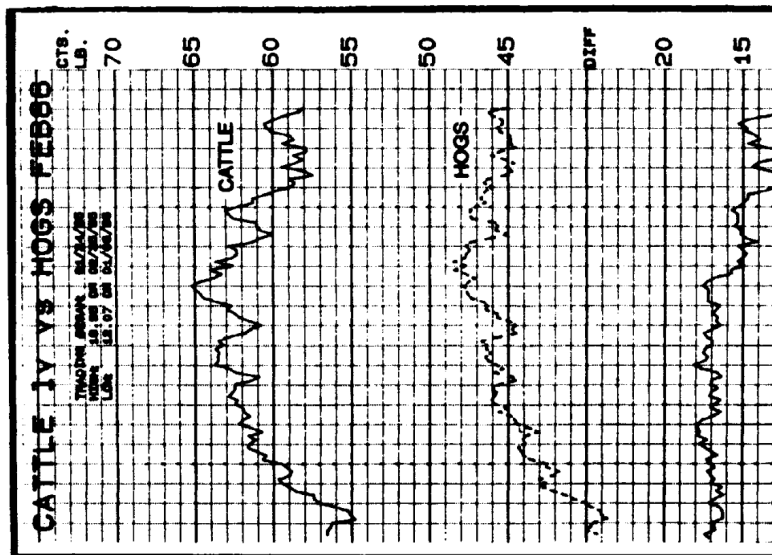
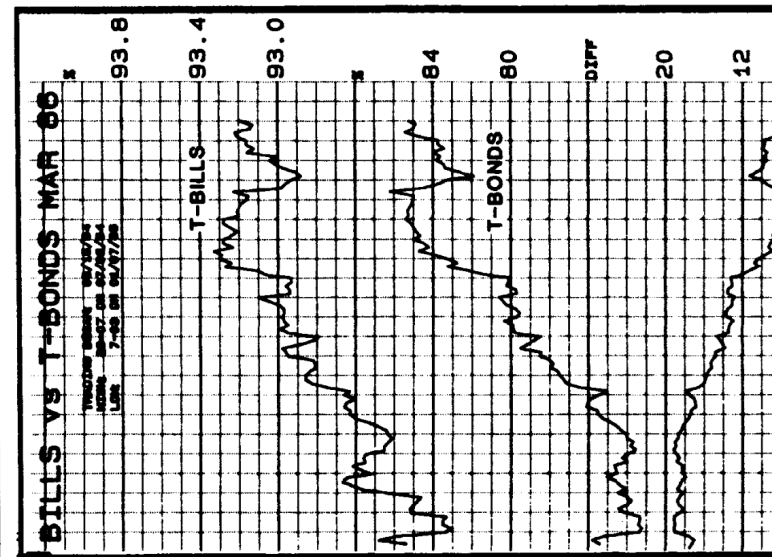
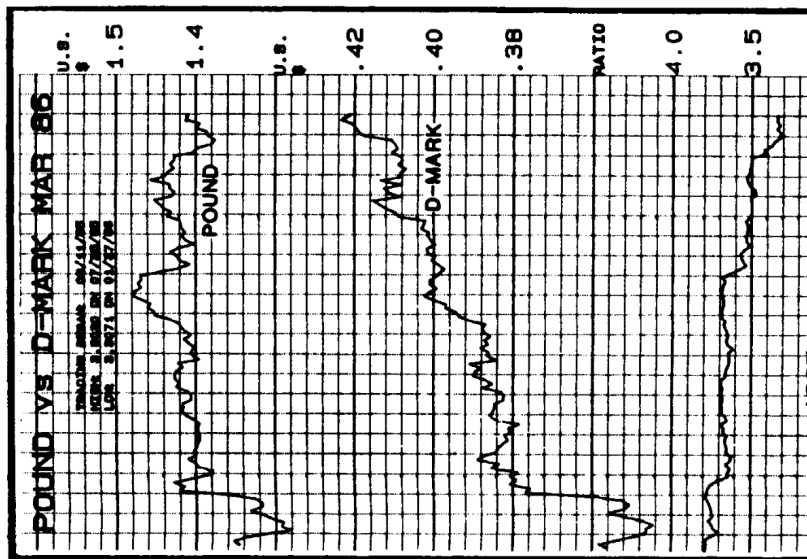
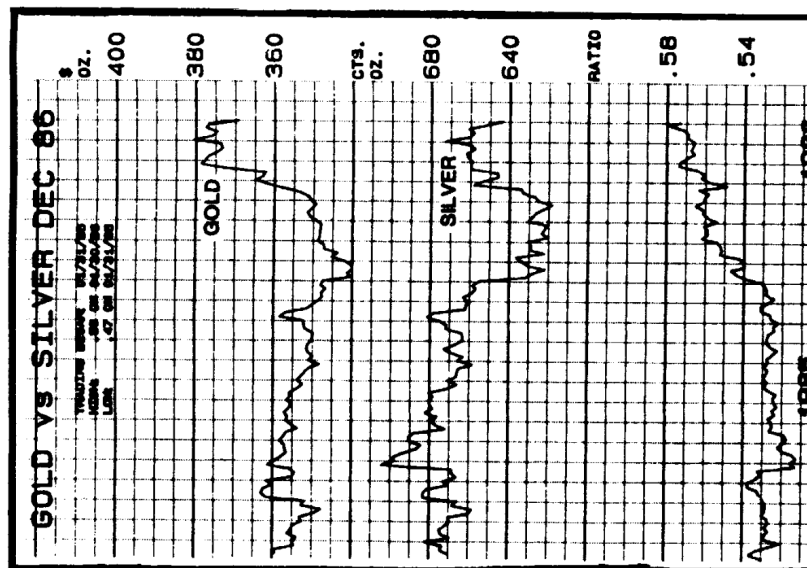


FIGURE 13-11 (Continued)



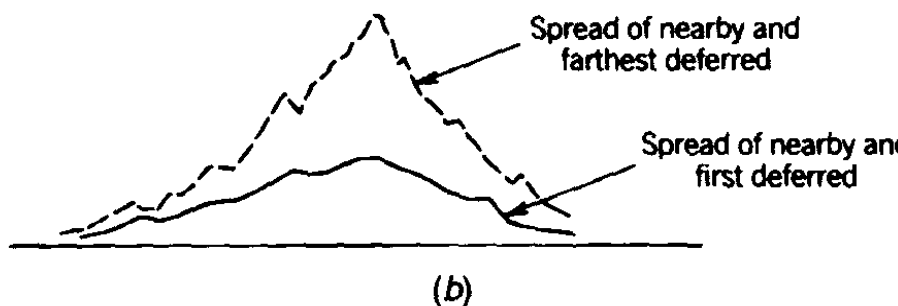
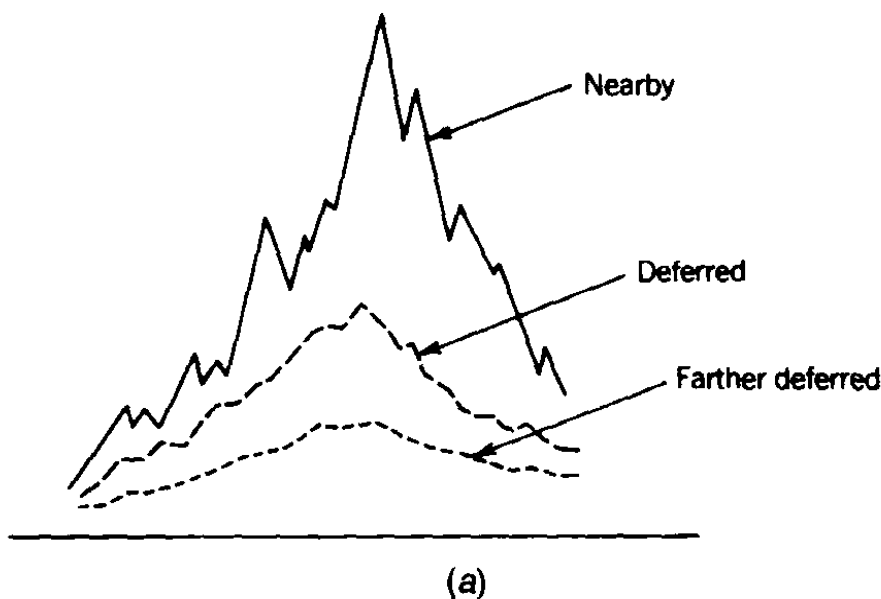
A spread can be a low-risk substitute for an outright long or short-trend position. In grains and foods, a bull market will result in prices of the nearby delivery months rising faster than deferred months. A bull spread can be placed by entering a long position in the nearby and a short position in a deferred month. Both risk and reward are reduced, the greater the time between months, the more volatile the spread (Figure 1312). As in an outright position, once the upward price peaks, the spread must be reversed because the nearby delivery will decline faster than the deferred. By selling the nearby and buying the deferred contract, a bear spread is established.

The analysis that identifies the time to enter a bull or bear spread can be a standard trend-following approach based on the nearby contract only. Many traders believe that the spread itself must also confirm the trend before a position is taken. Therefore, a moderate-speed moving average may be applied to the spread series. This would provide a signal based on the relative change in spread direction. A simple 1-day change might be enough for the fast trader. An upward trend signal in the nearby delivery and a bear spread movement is a conflict that should be passed.

Legging In and Out of a Spread

When both contracts, or legs, of a spread are not entered or closed out at the same moment, trading risk is increased. An unprotected leg of a spread is simply an outright long or short position and must be managed carefully. Consider a bull spread in a fast-moving market. Although both legs can be entered simultaneously using a spread order, the long position (in the trend direction) might be entered first, followed by the short leg within a few minutes or a few days. If the market is trending steadily, profits in the long position can be protected when the short leg is entered. Legging in is a rewarding philosophy when it works. When it doesn't work, there is a large loss on the outright

FIGURE 1312 Interdelivery spread volatility. (a) Actual prices. (b) Relationship of interdelivery spreads.



329

position, which will be difficult to offset with the lower profits from the spread. If the purpose of trading a spread is to reduce risk, legging in or legging out is not going to accomplish that goal.

Protecting an existing trend position in the nearby month by spreading with the next deferred delivery is not as good as simply liquidating the initial position. If the market has been going up and indicates a temporary downturn, some traders will hedge by selling the first deferred contract. The result is a bull spread instead of an outright long. If the anticipation of a price reversal was correct, the trade risk is reduced but there is still a loss. If the decision was wrong, profits are reduced. Converting a potentially losing outright position into a potentially losing hedge changes the size of the loss or profit. It is much simpler to close out

the position rather than defer the decision.

When the trend turns from up to down, it is necessary to switch the spread from bull to bear. If large profits have been made in the bull move and both the trend and spread signal a downward turn, it could be tempting to lift the long leg and hold the outright short using accrued profits to offset the increased risk. A more conservative trader might enter a bear spread in the first and second deferred months rather than the spot and first deferred, thereby reducing risk even further and allowing smaller profits conserving prior success.

Reverse Response to Trending Markets

Some spreads respond in just the opposite way to trends. For precious metals and potatoes, an upward trend results in the deferred contracts rising faster than the nearby. For example, consider the rising price of gold, which results in a larger total contract value and, consequently, a higher interest charge based on that value.

Traders familiar with the potato market will know that higher prices, which reflect greater demand and product disappearance, will result in critical tightness in the last winter trading month. The perishable potato crop must last to early June when the first spring potatoes reach the market. Early demand on the stored crop will magnify the volatility as end of spring approaches. For both metals and potatoes, a bull spread can be entered by selling the nearby and buying the deferred contracts.

Exceptions to the Rules

During a trending period, most markets exhibit a clear relationship between delivery months. Cattle, hogs, broilers, and eggs are nonstorable, however, and show little relationship in the response of deferred contracts to the same bullish or bearish news.

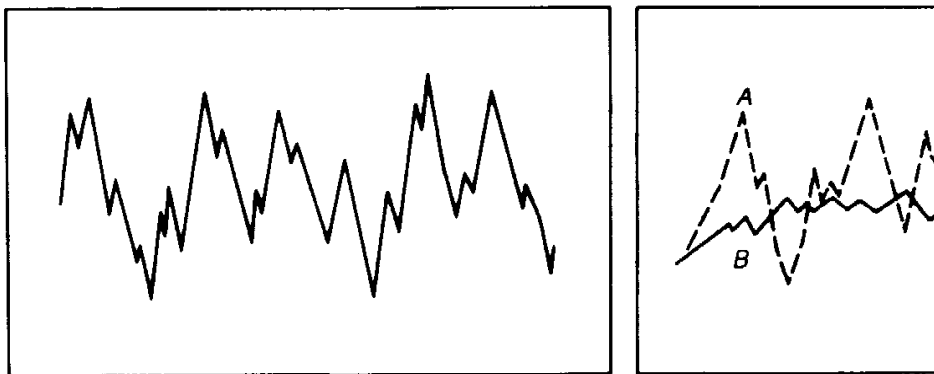
During periods of exceptional demand, livestock may be marketed early causing a strong similarity in the price patterns of cattle and hogs in the nearby contracts. Even in the most extreme cases, this pattern cannot be carried far into the future.

VOLATILITY AND SPREAD RATIOS

Higher price levels result in increased volatility in both individual markets and their related spreads. Fast price movements and large swings associated with high price levels will create spread opportunities that are more profitable than normal; markets with small movement are not candidates for spreads. The combination of two low volatility markets produces spreads with such small potential that execution costs often exceed the expected profits.

The two sides of a spread rarely have the same volatility. When badly mismatched, a spread will act the same as if you had taken an outright position in the more volatile side of the spread. For example, Figure 1313a shows what appears to be an excellent spread relationship; however, Figure 1313b reveals that the pattern is the result of two sideways markets, one highly volatile (A) and the other with low volatility (B). Market B offers little protection if market A were to move sharply higher instead of sideways.

FIGURE 1313 Poor spread selection. (a) Spread price. (b) Spread components.



(a)

The same illustration would be appropriate if a gold/silver spread were created by subtracting the price of silver from that of gold rather than taking a ratio. Equal moves of 10% in gold from \$300 to \$330 and silver from \$6.00 to \$6.60 would result in a spread price change from \$294.00 to \$323.40, effectively mirroring the gold change rather than maintaining an unchanged spread.

Spread Ratio

The markets which offer sound spread opportunities will vary in their absolute price range or volatility. For example, during 1984, the price of spot live hog futures varied from 43.800 to 58.00c per pound, whereas pork bellies ranged from 54.700 to 74.10c per pound. Both appear to be consistent in volatility as seen from the ratios, yet more than a 50% difference occurred in the size of the price change.

Had the ratio been seen to drop to 1.15, a long bellies, short hogs spread would have been entered. If the ratio had moved to 1.35, a spread would have been entered to buy hogs and sell bellies. Assume that this distortion occurred at prices near the lows and that prices then adjusted to 1.27 at the highs shown in Table 132. There are two possible trades that might have occurred:

TABLE 132 Price Movement of Pork Bellies and Live Hogs in 1984

	<i>Spread Price</i>	<i>High</i>	<i>P/L</i>
Case 1: Long bellies	50.00	74.10	\$24.10
Short hogs	43.48	58.00	(14.52)
Ratio	1.15	1.27	
Case 2: Short bellies	54.70	74.10	(19.40)
Long hogs	40.52	58.00	17.48
Ratio	1.35	1.27	

	<i>Low</i>	<i>High</i>
Pork bellies	54.70	74.10
Live hogs	43.80	58.00
Ratio	1.25	1.27
Spread	10.90	16.10

331

In Case 1, the trade produces a profit while the relationship adjusts to normal; in Case 2, there is a loss even though the same adjustment occurs. Two factors cause this: the different contract sizes and the absolute price range. If the contract sizes were adjusted to equal units, which can be done by trading four bellies and five hog contracts, the results would be:

	<i>P/L per Contract</i>	<i>N C</i>
Case 1: Long bellies	\$9,158	
Short hogs	(4,356)	
Spread results		
Case 2: Short bellies	(\$7,372)	
Long hogs	5,244	
Spread results		

This is slightly closer to the correct results but not yet right.

Adjusting the number of contracts for volatility means attempting to equalize percentage moves per unit size. The range of 14.20 in hogs and 19.40 in bellies combined with their contract size gives:

	<i>Range</i>	<i>Contract Size</i>
Bellies	19.40	38,000
Hogs	14.20	30,000

For convenience, the ratio will be taken as 1 : 2, which means trading two hog contracts for every one pork bellies contract. Then:

	<i>P/L per Contract</i>	<i>Number of Contracts</i>	<i>Net</i>
Case 1: Long bellies	\$9,158	1	\$9,158
Short hogs	(4,356)	2	(8,712)
Spread results			\$446
Case 2: Short bellies	(\$7,372)	1	(\$7,372)
Long hogs	5,244	2	10,488
Spread results			\$3,116

Using the relative volatility and contract size to produce a spread ratio gives the correct results.

Metal Relationships

Most metals markets showed extreme volatility in early 1980 as a result of the silver crisis. Table 133 gives the comparable futures price moves of the four major metals markets and shows the spread ratios that should have been used.

332

TABLE 133 Metals Volatility and Spread Ratios

	<i>Cash Prices</i>			<i>Contract Size</i>	<i>Ra</i>
	<i>1978</i>	<i>1980</i>	<i>1985</i>		
Gold (\$/oz)	150	850	300	100 oz	7
Platinum (\$/oz)	170	420	300	50 oz	2
Silver (\$/oz)	5.00	38.00	6.50	5,000 oz	33
Copper (\$/lb)	.60	1.35	.65	25,000 lb	

Gold is seen to be much more volatile than either platinum or copper but less than silver. During this volatile period, a spread of five platinum to one gold, four copper to one gold, and two silver to five gold would have been necessary. Unfortunately, this spread ratio represents an

exceptionally volatile period. From the beginning of 1985 through June 1986, the monthly average spot gold price varied from \$302 to \$345 per ounce; silver prices ranged from \$5.11 to \$6.45 per ounce. This produces the following relationship:

	Range	Contract Size
Gold	\$43/oz	100 oz
Silver	\$1.34/oz	5,000 oz

The ratio of three gold to two silver is normally most practical but is not safe enough when prices move above these levels.

Volatile Spreads

Trading a high-priced spread is always riskier than one where both legs are at normal levels for the following reasons:

1. If only one leg is at a high level, the profitability of the spread depends entirely on the profitable trading of the most volatile leg.
2. If both legs are volatile, specific events may cause them to move independently, creating unprecedented spread levels.
3. Highly volatile spreads are usually in nearby months and may not adjust to normal before the expiration of the contract. At expiration, extreme demand in the cash market may cause further unusual spread differences.
4. A highly volatile spread may have greater risk than a single outright position in one leg. This is not usually the purpose of a spread trade.

LEVERAGE IN SPREADS

Because a spread is the difference between two or more fundamentally related markets or delivery months of the same market, the risk is usually less than that of an outright long or short position. Interdelivery spreads within the same crop year, or in nonagricultural products, are recognized by the exchange as having lower risk. The result is that spread margins can be less than 20% of the margin required for a nonspread position. Because the m-

333

on outright positions may be as low as 5% of the contract value (underlying asset), the spread market can be as low as 2%.

The profit potential is also less for a spread than for a net long or short position. You would expect that, if the margin requirement is 20% of the outright position, then both the risk and reward of the trade would be about 20% of an outright position. That is not necessarily the case. In agricultural products, the bull and bear spreads can be highly volatile; in contrast, the potential for an intramarket metals spread is equal to the change in interest caused by higher and lower contract values. Traders manage to compensate for the lower profits and risks by taking advantage of the smaller margins and entering more positions. With five contracts, the trader has managed to

convert a conservative spread trade into the same risk and reward as a nonspread trade perhaps with even higher risk without added capital. The small trader, however, should not leverage spreads to their maximum.

Some trades that derive the benefit of spread margins are not always of proportionately less risk. For example, when the IMM began, any two currencies could be spread with reduced margin. A short position in the Deutschmark against a long position in the Mexican peso would hardly have been considered reduced risk when the first devaluation of the peso occurred. The trader must keep in mind that the decrease in margin, which accompanies spreads entered on the same exchange, will cause a substantial increase in leverage and may counteract the intrinsic risk reduction in a spread that was related to the smaller price movement. Spreads are not necessarily less speculative or safer than trading a single net long or short position.